

# **Milton-Madison Bridge Project**

2013 Road School  
March 6, 2013

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Indiana Department of Transportation



## Project Partners



## Project Location



**Halfway** between Cincinnati and Louisville  
Nearest bridge is on Markland dam **26 Miles** away.

# Connecting two Historic Towns

## MADISON, INDIANA

- Largest National Historic Landmark District with 1,800+ buildings
- Clifty Falls State Park & other tourist attractions, including Madison Regatta
- Population 12,600

## MILTON, KENTUCKY

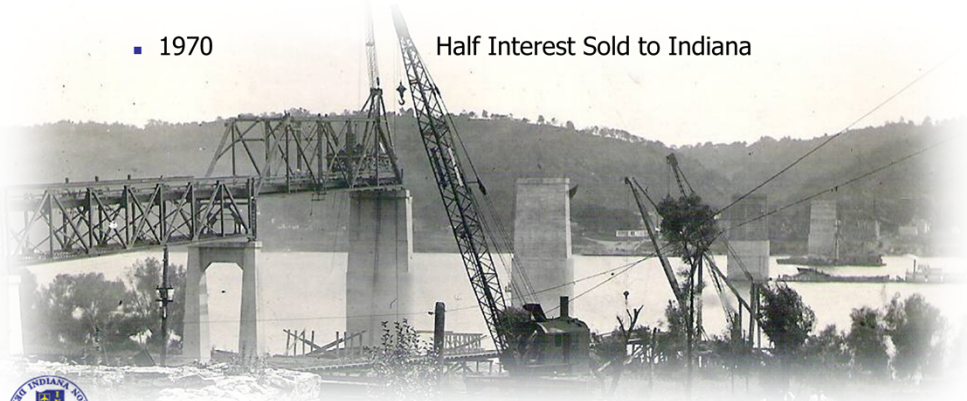
- Historic river town susceptible to flooding
- Rural community divided by 400 ft tall bluff
- Population 600





# Bridge History

- 1929 Built by J. G. White through National Toll Bridge Company
- 1939 Purchased by Kentucky – tolled until 1949
- 1970 Half Interest Sold to Indiana



## US 421 Bridge in 2009

- 10,700 vpd (2008)
- 4% truck traffic
- *70% of bridge traffic destined for Madison*
- 48 reported crashes on bridge in 4 years, plus other minor accidents (trucks knocking off side view mirrors)
- Last major rehabilitation in 1997
- *Weight limit posted in April 2009 to prohibit trucks over 15 tons*



## Project Purpose and Need

- Sufficiency Rating of 6.5 out of 100
- KYTC Structurally Deficient List

Functionally Obsolete



Structurally Deficient



Sufficiency is measure of

S1 = Structural Adequacy and Safety

- S2 = Serviceability and Functional Obsolescence

– ADT

– Approach roadway width

– Deck clear width

– Deck condition grade

– Vertical clearances

- S3 = Essentiality for Public Use

– ADT

– Detour Length

- S4 = Special Deduction



## NEPA Project Management Structure

- Led by the "M3T" – leadership from KYTC, INDOT, and FHWA in both states
- Extensive coordination with
  - Stakeholders
  - Resource agencies,
  - Historic preservation groups,
  - Project Advisory Group
  - Members of the public
- Extensive media coordination
- Project Website

*States and FHWA agreed to regular meetings where key decisions were made*

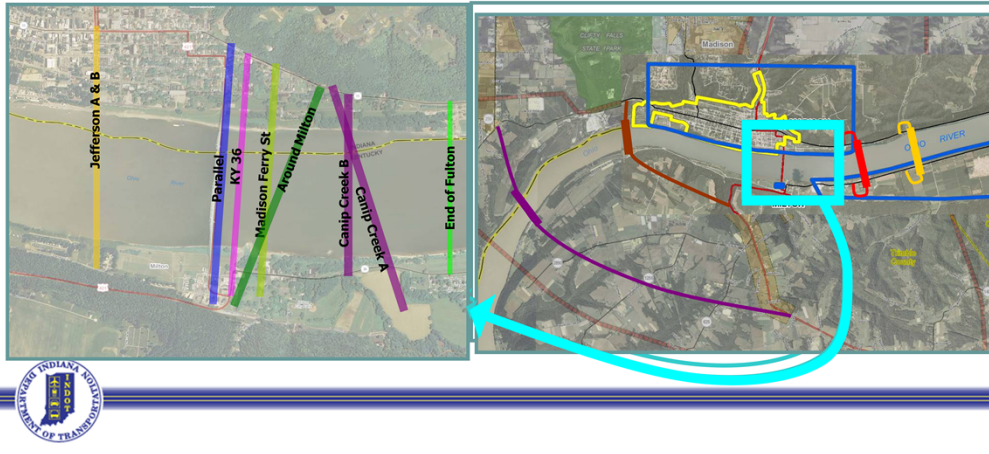


# Initial Alternative Screening

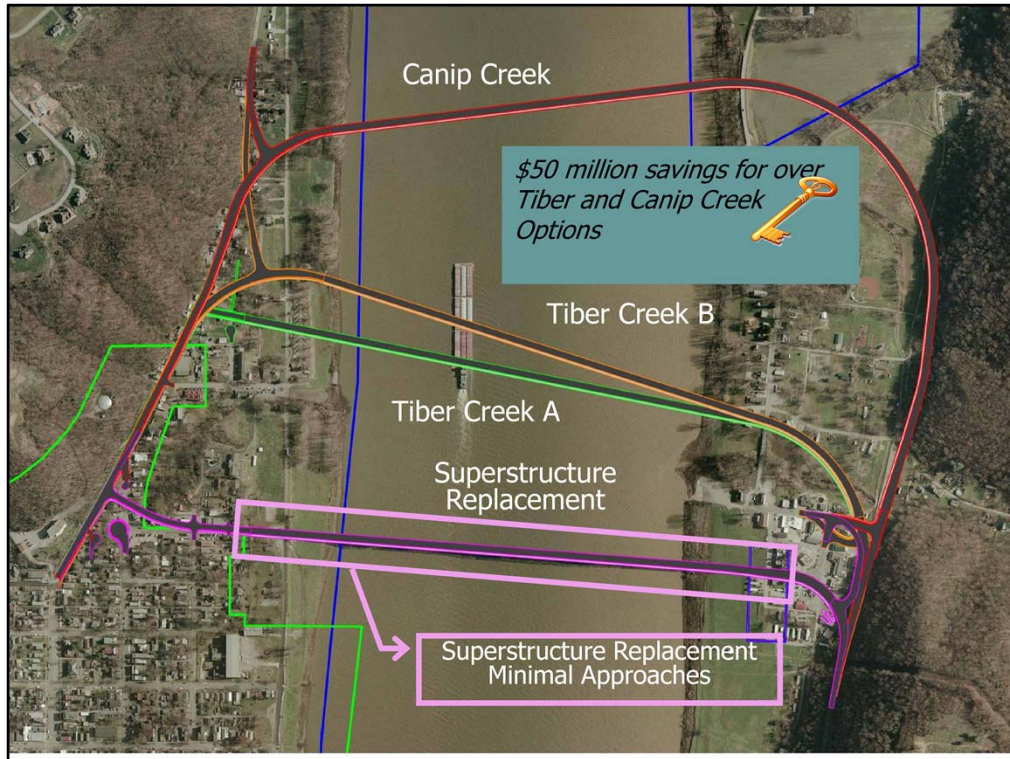
***ALL alternatives considered***



1. Do Nothing
2. Rehabilitation
3. Superstructure Replacement
4. Multiple New Alignments (12)
5. Transit





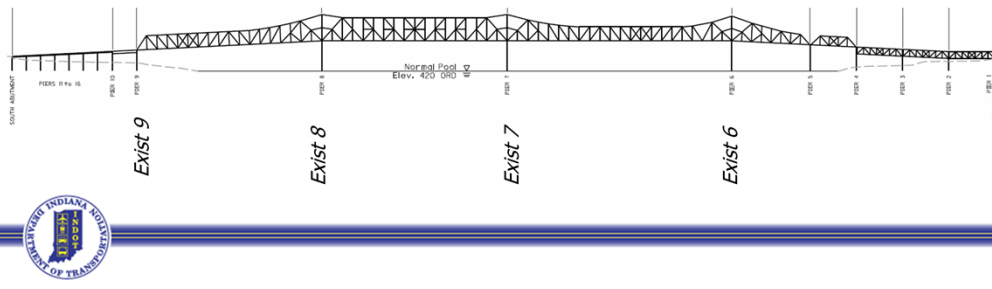


## Original Caisson and Pier Construction



# Pier Testing and Inspection

- Physical Inspection Feb-Mar09
  - Non Destructive testing
  - Lab Testing of Samples
  - Existing Condition and Service life Assessment Reports





## Substantive Pier Inspection

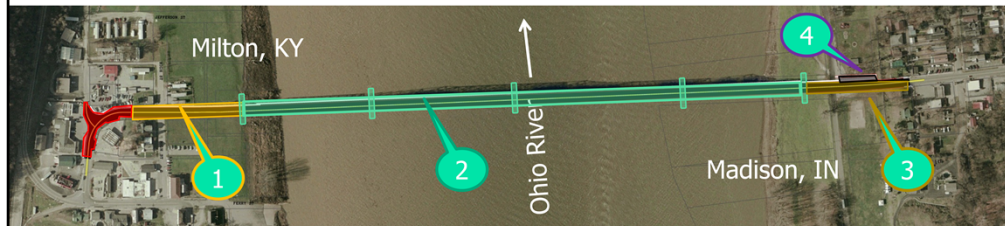


## Superstructure Replace with Minimal Approaches

- Key Reasons for Selection
  - Fracture Critical Inspection / Continued Bridge Deterioration
  - Limited Impacts To Historic Resources
  - Piers Are Structurally Sound
  - Lowest Cost Alternative
  - Availability Of TIGER Grant
  - Fastest Completion And One Year Maximum Closure Time



## Superstructure Replacement with Minimal Approaches

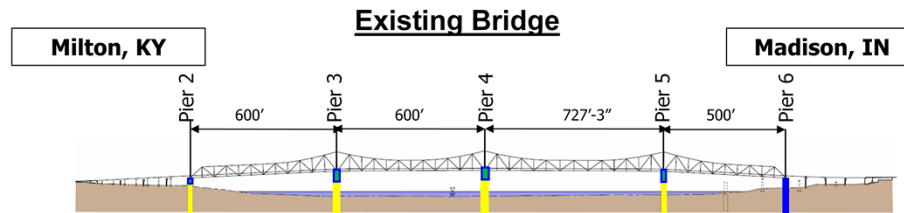
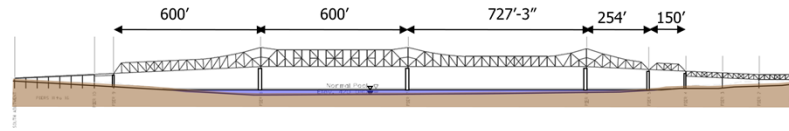


- Milton Approach re-construction
- STR 1 replace KY Approaches
- STR 2 Truss replacement
- STR 3 Replace IN Approach
- STR 4 Pedestrian Access to Park

***No Right-of-Way  
required***



# Superstructure Replacement Profile



*Navigation Channel does not need to be widened*



## Proposed Bridge

- Strengthen Existing Pier
- New Pier Cap
- New Pier



## Section 106 Commitments

Truss Profile “appearance” is established

Minimal Sway Bracing

TF-2 Rail

All Truss Piers have similar appearance



## Section 106 Commitments

- New truss superstructure mimicking historic truss profile
- Free Ferry Service operating 24/7 between Milton & Madison
  - Plan to minimize disruptions from traffic using ferry
  - Temporary modifications at campground & boat ramp to create docks
- Funding for local programs to offset economic impacts of closure
  - Tourism/Marketing campaign in both cities
  - Historic Preservation Officer for Madison
  - Local business assistance through Madison Main Street Program
- Commitment to follow Section 106-like process on any future approach improvement projects (not programmed in either STIP)
- Measures to offset loss of historic bridge
  - Preserve builder plates from existing bridge
  - Photo documentation of existing bridge
  - Restoration of 1929 film of original bridge opening ceremony

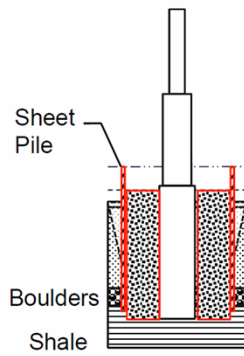


## Criteria for a Successful Alternative

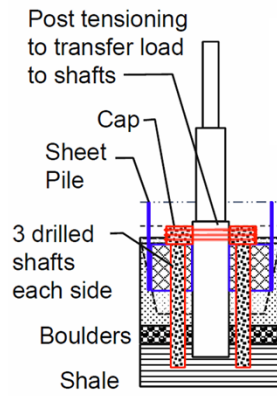
1. Assure 75 year service life
2. Feasible
3. Permittable
4. Visually Acceptable
5. Develop Design Criteria



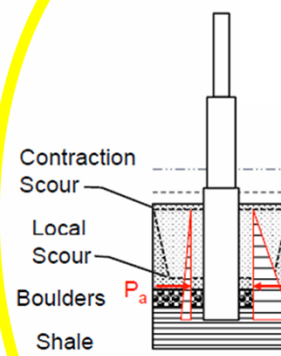
# Foundation Options Considered



**Encasement**



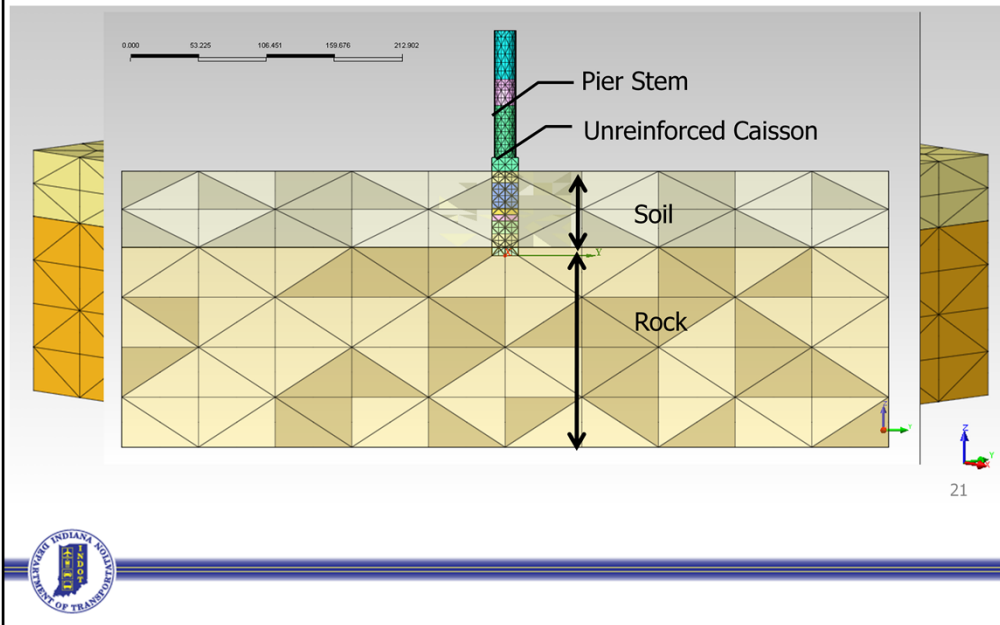
**Drilled Shafts**



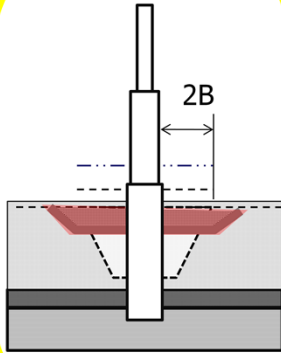
**Soil Response**



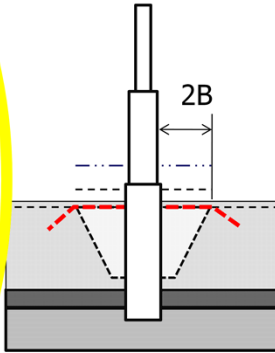
# Finite Element Method Required



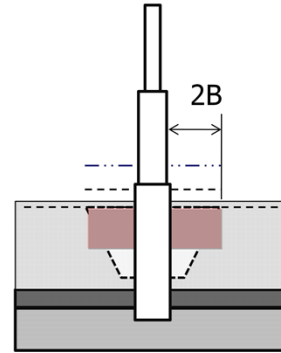
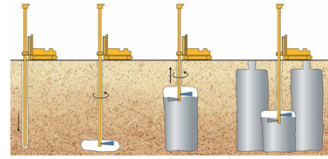
# Scour Mitigation Measures



Rip Rap with  
Filter



Articulated Block Mat

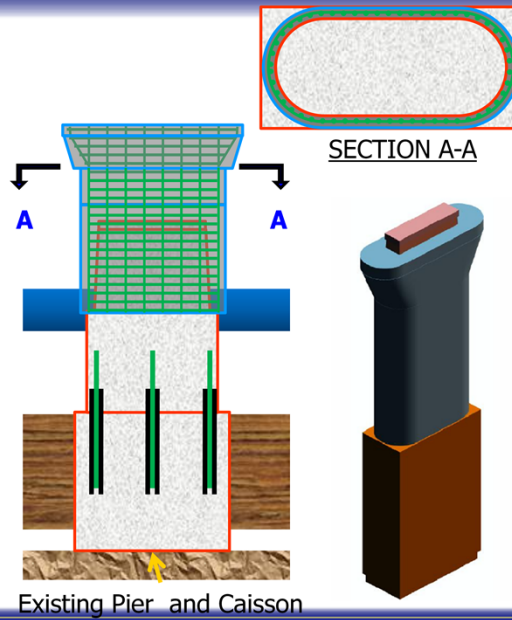


Jet Grouting



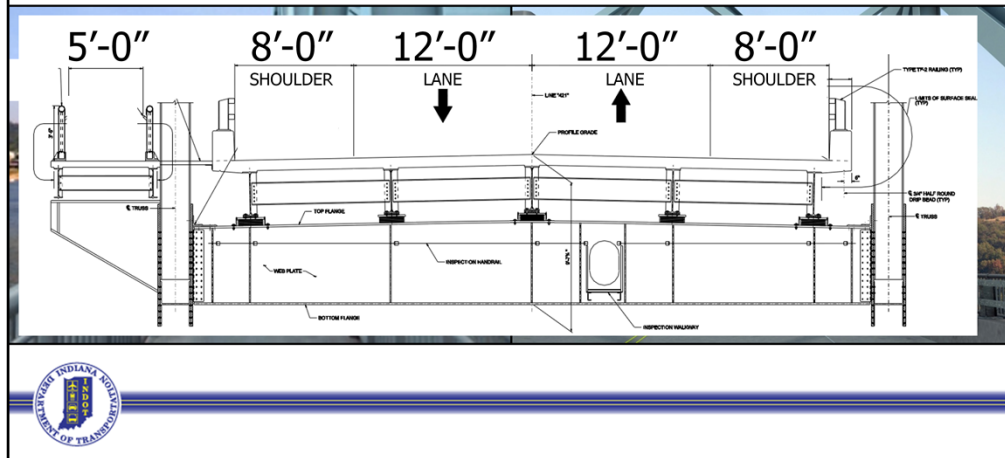
## Proposed Pier Strengthening

1. Drill holes into existing unreinforced caisson
2. Grout Rebar into Caisson
3. Add Stem Reinforcement
4. 2' thick encapsulation
5. Pier Cap Reinforcement
6. Form and Cast new Pier cap



## New Structure Typical Section

- Existing Bridge clear width is 20'
- 5' pedestrian sidewalk



## Selected Alternative



**Existing Bridge**



**Proposed Bridge**



## Key Project Documents

In-depth Engineering Study resulted in criteria and information documented in the following:

- A. Scope of Services
- B. Project Special Provisions
- C. Contract Bridge Drawings
- D. Contract Plan Details
- E. Project Specific Reports (Binding)
- F. Project Specific Reports (Information Only)



# Project Reports & Special Provisions

## Binding Project Reports

- i. **FINAL REPORT - STUDY OF VESSEL COLLISION ON BRIDGE PIERS, MILTON MADISON BRIDGE, MARCH 2010 (BAKER)**
- ii. **WIND ENGINEERING STUDY - FINAL REPORT (RWDI)**
- iii. **MILTON-MADISON BRIDGE, GEOTECHNICAL OVERVIEW (KYTC/BAKER)**

## Other Project Specific Reports (Information Only)

- i. **PIER STRENGTHENING REPORT FOR EXISTING PIERS 6-9 (BAKER)**
- ii. **EXISTING PIERS SERVICE LIFE ASSESSMENT (CTL)**
- iii. **FINAL ENVIRONMENT ASSESMENT REPORT FOR THE MILTON MADISON BRIDGE (WSA)**
- iv. **PRELIMINARY HYDRAULIC and SCOUR ANALYSIS REPORT (WSA)**

## Design Criteria Special Provisions (Binding)

- i. **STRUCTURE PERFORMANCE CRITERIA (SPC) FOR BRIDGE NO.2**
- ii. **STRENGTHENING OF EXISTING PIERS**



## Unique Contract Requirements

- Commitments
  - Ferry System
  - Historic Structures
  - Coordination for Peregrine Falcon
- Construction Requirements
  - High Performance Concrete (HPC)
  - Strengthening of Existing Piers (Caissons)
  - Scour Countermeasures
  - Contractual Dates
- Other Pre-Bid Activities





## Ferry System

- Input from Local Government/Businesses
  - 52 Mile Detour Route (Markland Dam)
  - Allowable Structure Closure = 365 Calendar Days
  - Minimize Impact to Local Citizens
  - Utilization of a Ferry System



# Ferry System

- Ferry System Specifications
  - Ferry Operations
    - 120 Vehicles per Hr per Direction
    - Limitations (Fog, Wind, Ice, High Water, Etc)
  - Temporary Ferry Staging Areas
    - Construct with Queue Area and Parking
    - ADA, Lighting, Restrooms, etc
    - Parking Management Plan
    - Restoration Plan



# Ferry System

- Ferry System Specifications
  - Public Awareness
    - Real Time Information w/ Dedicated Website
    - Current Wait Times and Operation Status
    - Advisory Radio Station, Telephone Hot Line, Message Boards and Social Networking
  - Coordination with EMS and USCG
    - EMS Radios and top priority
    - USCG Certificate of Inspection
    - Licensed Mariner



## Historic Structures (Vibration Monitoring)



Requirement to monitor construction vibration at three structures.

Perform pre and post construction inspections of the structures.

Submit a monitoring plan which details equipment, key personnel, daily logging, real time alerts and general protocol.

Specific threshold of 0.2 in/ second given (peak particle velocity).

Construction operations in the area would be stopped and a visual survey would be performed.

## Historic Structures (Foundation Monitoring)



Another requirement in addition to the vibration monitoring was the daily foundation crack monitoring to determine movement of structure.

Distance between fix points would be recorded.

## Coordination for Peregrine Falcon



## Coordination for Peregrine Falcon

- Federal
  - Endangered Species Act in 1970
  - Delisted 1999
  - Migratory Bird Treaty Act
- Commonwealth of Kentucky
  - Listed as Endangered
  - Greatest Conservation need in Kentucky's State Wildlife Action Plan
- Nest on Structure



The Peregrine Falcon was listed as endangered on the Federal Endangered Species Act in 1970. Largely due to the ban on DDT in 1972 and the release of captive birds, the falcon has been delisted.

The Peregrine Falcon is still protected Federally under the Migratory Bird Treaty Act.

Falcon is still listed as Endangered in the Commonwealth of Kentucky and is considered to have the greatest Conservation need in Kentucky's State Wildlife Action Plan.

Falcon was nesting on the Structure at the time of letting.

## Coordination for Peregrine Falcon

- Special Provision Requirements
  - KDFWR Coordination
  - Relocation of Nesting Box
  - KDFWR Access to Box
  - Potential Nesting Sites
    - Cover February 1 – June 30
    - No Work w/n 300' of Nest





## High Performance Concrete (HPC)

- HPC Specifications
  - Materials
  - Sampling
  - Acceptance
  - Thermal Control Plan



High Performance Concrete. Purpose is to contain a low paste content, low permeability, high strength and long life.

## High Performance Concrete (HPC)

- Materials

- 3 Cementitious Materials
- Paste Content @ 25%
- Alternate Aggregate Gradations
- Type F or Type G Admixtures
- Trial Batch



Cement, fly Ash and Silica Fume

Low Paste content

The use alternate gradations would be allowed. Fine aggregate 35% to 50%. #23 Sand and #5 Aggregate could be changed.

## High Performance Concrete (HPC)

- Sampling
  - Cylinders
  - Unit Weight
  - Air and Slump
  - Yield (Information Only)



Cylinders for compressive instead of flexural strength.

Cylinders for permeability testing also. Resistance to Chloride Ion Penetration.

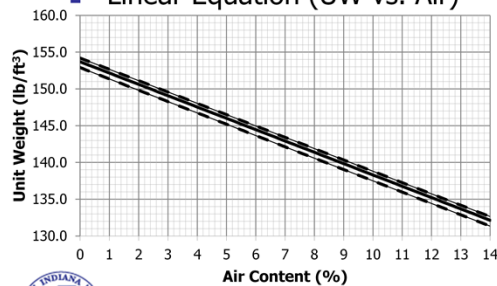
½ cft bucket instead of ¼ cft yard for unit weight

Standard Air and slump.

Yield was taken for information only.

## High Performance Concrete (HPC)

- Acceptance
  - Permeability
  - Strength
  - Air
  - Slump
  - Water/Cement Ratio
  - Linear Equation (UW vs. Air)



Resistance to Chloride Ion Permeability Testing (OMM) 1500 coulombs limit at 56 days

Strength (On site testing trailer) 5000 psi

Air was targeted at 5%-8%

Slump range was increased. 4" to 7.5" allowed but must meet all other parameters including 25% paste. So no extra water to achieve slump.

Water/Cement ratio was required to be between 0.40 and 0.44

Linear Equation with upper and lower limits were based on trial batch. Unit weight and Air then plotted on the linear equation chart. Specific requirements for results outside of the required limits.

# High Performance Concrete (HPC)

- PBTDL Thermal Control Plan

- Mass Concrete
- Thermal Modeling
- Temperature Control
- Curing Methods
- Temperature Monitoring
- Verification of Control
- Corrective Measures



## Performance Based Temperature Differential Limit Plan (Thermal Control Plan)

- 1) Identification of mass concrete placements. Mass concrete is any placement with a minimum dimension of 4'.
- 2) Perform thermal modeling to predict maximum core concrete temperatures and surface-to-core temperature differences.
- 3) Maximum temperature and differential temperature control measures.
- 4) Curing methods
- 5) Temperature Monitoring (Hourly recording of remote sensors)
- 6) Verification (Monitoring is within the modeling criteria)
- 7) Corrective measures.

## Strengthening of Existing Piers (Caissons)



Strengthening of the existing caissons shall have reinforcing placed 36" on center with intermediate # 11 reinforcing.

Coring only. No drilling, blasting or impact operations. Contractor to ensure that the operation does not affect the face of the caisson.

Place reinforcing steel and fill annular space with High Strength, Non-Shrink Grout.



## Strengthening of Existing Piers (Caissons)



Contractor required to test caisson reinforcing method and can perform either production or non-production testing.

Contractor must use the exact equipment, materials, coring and grouting procedures which are to be used in production operations.

Reinforcing configuration must reach 90% of full yield strength without deformation of the reinforcing or bond failure of the high strength grout.

If failure occurs, contractor must modify materials or procedures and repeat tests until two test specimens are successful.

## Scour Countermeasures

- USACE Input
  - Specific Elevations and Dimensions
  - Specific Thickness
  - Specific Gradations
  - Specific Placement
  - Pre and Post Construction Surveys



Majority of Operations were covered under the design/build lump sum items.

Scour Protection was one of the few operations which were itemized in the contract.

This operation was itemized due to the specific requirements set forth by the USCG.

Elevations and dimensions given in the plans.

Minimum thickness also given in case of a differing site condition.

Gradations from 11 inches to 36 inches given.

Riprap to be placed and not dumped.

Pre and post construction surveys to be performed to confirm placement.



## Pre-Bid Activities

- Advertised in June 2010
- Pre-Bid Meeting
- Optional Site Visit
- Design Alternate Meetings
- Technical Proposal
  - Meetings
  - Scoring



INDOT required all of the bidders to attend a mandatory pre-bid meeting.

Optional Site Visit after the pre-bid meeting.

Design/Build teams were required to submit a technical proposal.

Allowed two technical proposal meetings prior to submittal. This allowed contractors to discuss technical alternatives.

INDOT scored the proposals based on predetermined criteria. Design/Builders must score a minimum of 80 points to place a bid.

## Low Bid Formula and Contractual Dates

- Formula for Effective Bid Price
  - Lowest effective bid wins.
  - Const. Cost, Closure Days and Open to Traffic Date
- $[A + B - \text{Adjustment}]$ 
  - A = Construction Cost
  - B = Closure Days x \$25,000/day.
  - Adjustment = \$3.75 million (September 2012)



## Design Build Proposals

Let in September 2010

Five Contractors submitted bids

Project was awarded based on :

- Cost to construct project (\$102-\$127 million)
- Length of bridge closure (10-365 days)
- Open to unrestricted traffic (Sept 2012/May 2013)



## Awarded Design-Build Team

### **Walsh Construction, Inc (CONTRACTOR)**

Construction firm in La Porte, IN

[www.walshgroup.com](http://www.walshgroup.com)

### **Burgess & Niple, Inc. (DESIGNER)**

Engineering firm in Columbus, OH and Indianapolis, IN

[www.burgessniple.com](http://www.burgessniple.com)

### **Buckland & Taylor (DESIGNER)**

Bridge engineering firm in Seattle, WA

[www.b-t.com](http://www.b-t.com)



## Spring 2011 Flooding



8 Flood Events

131 Flood Days

20 Days/Year allowed in the Contract



Walsh is on track to complete the contract within the time granted for excusable delays.

# QUESTIONS?

